Optical model potentials for α-particles scattering around the Coulomb barrier on medium-mass nuclei

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The double-folding formalism [1] of the α-nucleus optical potential has been applied within a semi-microscopic analysis of the α-particle elastic scattering on A$\sim$50 and A$\sim$140 nuclei at energies below 32 MeV, the first phase of the work was concerned with A$\sim$100 nuclei [2]. The energy-dependent phenomenological imaginary part for this semi-microscopic optical model potential (OMP) is obtained as well as the dispersive correction to the microscopic real potential. This imaginary potential is then introduced within a complete phenomenological analysis of the same data basis. A global or at least a regional parameter set of the phenomenological OMP for low-energy α-particles has thus been obtained for medium-mass nuclei. This approach provides finally an optical potential parameter set easily used in further analyses or predictions to basic scattering problems in nuclear physics as well as in nuclear technology. It will be used and checked in the analysis of either the α-induced or (n, α) reaction cross sections. These were not taken into account in this work to avoid the discussion of the remaining statistical model parameters (see, e.g., Ref. [3]), as well as the uncertainties in the parameters expected for the predictions for α-particles emitted from excited compound residual nuclei [4]. Further work will concern the energies between 40 and 80 MeV, in order to complete the description already provided for higher energies [5].

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